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Series (2) is equivalent to $\frac{1}{2!} + \frac{2}{3!} + \frac{3}{4!} + \dots + \frac{n}{(n+1)!} + \dots$

*This becomes $\sum_{n=1}^{\infty} \frac{n}{n+1!} = \sum_{n=1}^{\infty} \left(\frac{1}{n!} - \frac{1}{(n+1)!} \right) = 1$.

Also solved by G. B. M. Zerr, and the Proposer.

AVERAGE AND PROBABILITY.

165. Proposed by HENRY HEATON, Atlantic, Iowa.

What is the average length of all straight lines that can be drawn within a given square parallel to one of the diagonals?

I. Solution by R. D. CARMICHAEL, Hartselle, Ala.

Their intersections along the other diagonal will be evenly distributed. The average length is thus readily seen to be one-half the diagonal $= \frac{1}{2}a\sqrt{2}$, where a = the side of the square.

II. Solution by J. EDWARD SANDERS, Hackney, Ohio.

Since the greatest length is $a\sqrt{2}$, and the least 0, the average length is $\frac{1}{2}(a\sqrt{2} + 0) = \frac{1}{2}a\sqrt{2}$; or by calculus,

$$\Delta = \frac{1}{a} \int_0^a x\sqrt{2} \, dx = \frac{1}{2}a\sqrt{2}.$$

Also solved by F. P. Matz, and G. B. M. Zerr.

166. Proposed by F. P. MATZ, Sc. D., Ph. D.

Find the average area intercepted by two non-intersecting chords drawn at random in a given circle.

Solution by the PROPOSER.

First Case. The two chords AB and $A'B'$ may be on the *same* side of the diameter XY .

Let $OA = r$, $\angle OAB = \theta$, $\angle OA'B' = \phi$, $\angle YOA' = \psi$, and $\angle YOA = \omega$; then area

$$AA'B'B = U_1 = (\phi - \theta + \sin \phi \cos \phi - \sin \theta \cos \theta)r^2.$$

$$\therefore A_1 = \frac{\int_0^{\frac{1}{2}\pi} \int_{\theta}^{\frac{1}{2}\pi} \int_0^{2\pi} \int_{\omega}^{\frac{1}{2}\pi} U_1 \, d\theta \, d\phi \, d\omega \, d\psi}{\int_0^{\frac{1}{2}\pi} \int_{\theta}^{\frac{1}{2}\pi} \int_0^{2\pi} \int_{\omega}^{\frac{1}{2}\pi} d\theta \, d\phi \, d\omega \, d\psi}$$

